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COMPARATIVE STUDY OF AMPHIBIAN (ANURA) BIODIVERSITY AT THREE SELECTED SITES IN RELATION TO PHYSICO-CHEMICAL ASSESSMENT OF YAMUNA RIVER AGRA

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Abstract

Present paper illustrates the water quality of Yamuna River from the Agra at various locations. Water samples were collected from three sites (Poia ghat, Bainpur Reserve forest and Taj Nature Walk) of Agra region, during months March to November. Samples were taken to the laboratory and examine, just then to observe the Amphibian species especially (Anura), few specific Anurans were found on the spot then monitored of them. Mainly observed that the impact of water quality on Anurans and studied that changes on their existence and also richness at breeding sites. Water analysis was also done for the parameters such as CO_2, Alkalinity, Chlorides, magnesium Mg, Na Sodium. Thus finding of such research reflects that the water quality of river Yamuna is so poor condition also harmful for all living things.

Keywords : Anurans, Physico-chemical, Extinction and Contamination

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Introduction

Biological diversity is primordial or fundamental to the fulfillment of human needs and it enclose the intrinsic and also anthropocentric significance correlated with it, exceptionally in terms of the ecosystem resources. An environment precious in biological diversity other than it offers the large formalize of alternative for sustainable economic activity, to sustaining human welfare and also adapting to transformation or change. During the last few years the ecology and ecotoxicology of amphibians fauna started monitoring to get attention, thats why of decreasing or heavy declines rate of amphibian population in India (Sparling *et al.*, 2000) (Houlahan *et al.*, 2000). Factually according to list of (IUCN) Union for the Conservation of Nature, there are about 787 endangered amphibian fauna, moreover about 1900 amphibian species investigated to be intimidate (Frost *et al.*, 2006) (Stuart *et al.*, 2008). Hence there are about 90% amphibians (Frogs & Toads), Mainly they are interrelated and main link between human and ecosystem health (Hages *et al.*, 2002) also they are such main factor or components of aquatic and terrestrial ecosystems (Unrine *et al.*, 2007). Such as most adult frogs and toads for surviving feed on invertebrate's fauna, therefore amphibians are important, energy adept trophic interconnected between insects and other vertebrate organism. Literally amphibians are sentient for environmental modification both in terrestrial and aquatic environment or habitats that too because amphibians have highly semi-premeable skins and besides different or disparate life cycle stages on the earth (Alfored and Richards, 1999). In spite of that the information about on the effects of environmental and aquatic contamination on amphibian species fact is very little to prove (McDiarmid and Micthell, 2000). To focusing such issues and conservation project for amphibians, this is main crucial implementation to understand the causes that control their diversity in the region because of that their are great performance or role in the aquatic ecosystem, that is reason; amphibians feed on insects also including numerous pest species of agriculture crops. Obvious they are also play role in important food sources for several animals such as reptiles, mammals water birds etc. hence the biggest role of economical importance For human beings as a food sources, other than this for medical resources in some areas, same as an source of future. Pharmaceutical drugs as the many endemic amphibians have restricted of dispensation, confined or fasciated to the rainforests of the western ghats (Mazzoni *et al.*, 2003, Daszak *et al.*, 2004, Zhou *et al.*, 2006, Vasudevan *et al.*, 2001). Although amphibian species have derived in two life stages such as tadpole which occur in water whereas adults-living and occur on land, in them included of frogs and tods and solamanders those are vastly different in shape and size. However the amphibian fauna of yamuna river at Agra region is less observed and explored as compared to other area or regions like the western ghats extent. In which that provides the perfect and supreme environment and habitats for the occurrence and richness of amphibians fauna. Amphibians are in grave danger of extinction due to human activities such as clearing land for agriculture, building dams and other man-made structures, and the spread of exotic plant and animal species. Worldwide, amphibian species are among the most threatened due to the fact that, according to the Global Amphibian Assessment, approximately one-third of all amphibian species are considered endangered. The contemporary era's fast evanescence or elimination of frog populations is undeniably the most catastrophic and devastating loss of biodiversity, and hence it is one of our country's most pressing environmental concerns. The most significant warning sign of climate change is the degradation, eradication, and alteration of natural ecosystems, whether on land or in water. The decline of amphibians has been proven by numerous studies conducted over the last twenty years. The truth is that it is mostly accountable for the water population. The water of river yamuna must be clean but

there is heavy toxicity due to enormous effluent as physico-chemical elements dissolved in it. Which has become a great curse for all aquatic species, other than this in which contaminates water and bad influence the quality of water and life also (Thenmozhi and Kauthi *et al.,* 2016). But this area supports a lot of people, mostly from farms, and that means a lot of anthropogenic pressures on natural biotic communities (Kauthik *et al.,* 2017). Earlier (Sathe and Bhoje, 2014), they said that amphibian species are economically important because they help with biological control and stop insect pests from getting out of hand. However, there is no attention and awareness for the value of amphibians recognition, as well as very little attention is conferred on conservation, diversity utility and also protection of amphibians fauna in India country. Wetlands provide the stability of nature as the habitats for fauna and flora, but truely, wetlands category are severely endangered often decaying day by day. Other than this wetlands also maintain the environment as well life support manner through helping in water quality improvement. Such as recharging of ground water, regulation of hydrological arrangement, storm protections, flood control as well as conservation of biological diversity.

Aim of the study- To study we have taken some physico-chemical parameters such as CO2, alkalinity, chlorides, calcium, Mg, Na and simultaneously we have taken from at two different study sites, during this study, we had examine to water quality at sampling sites and also observed and analysed amphibian (anura) species from each locations, where explained or stated the huge effect of water quality parameters on Anura also explored and Trace the growth of their populations, richness at breeding sites.

Literature Review- Chandanshive *et al.,* (2007) studied the fish life in the Pavana River, which is an important waterway in Maharashtra that flows into the Mula and Mutha rivers, near Pune. About 59 different fish species were discovered in the Pavana River, and their analysis revealed that these fish were in risk due to pollution from homes and businesses. Arunkumar *et al.,* (2016). In their search for fish, they investigated geographic information systems (GIS). Nearly 37 distinct fish species were found in the Cauvery River at various locations, according to the Fauna (GIS) system, which also maps the pattern of fish diversity and habitat quality. Negi and Banyal (2017) conducted Two fish species belonging to two genera, one family, and one order were studied in the Ichtiyo fauna of the Rakchham-chhitkul wildlife sanctuary in Kinnaur, Himachal Pradesh. Sharma (2005) observed that the calling is the unique or basic characteristic part of the male frogs. Such as the male frogs produce sound to attract the female frogs during the breeding season. Although according to researcher considered that the calling quality of each species is varied from an other and it may be use as a speciality of disquishing manner of the frog species. Frogs sound followed by the researcher also identification based on frogs sound in Rajasthan. Daniels (1997) found that about 120 amphibian species occur in western ghats moreover more than 60 species estimated in Eastern Himalya, although many species occurrence endemic. Often out of these more than about 100 species are anurans (Frog and Toads). Inger & Dutta (1986) reported I generated a distribution list of amphibians in India, categorized them as anura, and then organized them by state. In their study from Rajasthan, they detailed six species, including Duttaphryn's malanostictus, microhyla ornata, fejervarya limnochoris, Hoplobatrachus tigernius, Euphlyctis cyanophylctis, and Sphaerotheca breniceps. Accordingly, E. hexadactylus was placed in the "doubtful" category of species. Arvind *et al.,* (2004) Emphasized that It is not surprising that the current report is based on an investigation of a new species of Anura frog from the Western Ghats hotspot, which has an exceptionally high calculation. The higher elevations may have been worried about it because it was constantly on the verge of happening.

Experimental Protocol: - List of sampling sites:-a.Poia Ghat**,** b.Bainpur Reserve Forest **,** c.Taj Nature Walk

Sample collection and Methodology of Anurans:- The entire research region was partitioned into three sections, each representing a different city and a forest reserve. Various approaches, including early morning and late evening observations, nets, and, most notably, traps set out along the riverbank, were used to collect samples from different spots in the study region between March and November. In order to locate the amphibian specimen, researchers dug up the ground to look for signs of burrowing frogs. In addition, to avoid suffocation, specimens were packed in jute bags. The relative abundance of aquatic anurans in the Yamuna river was determined, and the areas and places of examination for each individual were recorded. Hence the anurans species identification and monitoring based on water qualities, moreover also identified the impact on frogs of water quality parameters. In which including anurans species richness abundance also including rate on reduction. Such as various places or just lie as three study sties were selected to determine the water quality parameters, site (a) Poia Ghat site (b) Bainpur Reserve forest site (c) Taj Nature Walk.

Measurement of Physico Chemical Parameter -To specific examine water quality parameters such included physico chemical parameters like as (CO2) Carbon Dioxide mg/L, Alkalinity mg/L, calcium mg/L, (Mg) magnesium mg/L (Na) Sodium mg/L were analysed by following the standard methods of APHA (1998).

Methodology of water quality parameters - Water samples were collected in pre cleaned container at various study sites, bank of Yamuna river, even though water samples were collected during the month of March to November from shallow bottom region. Based on water quality parameters as we determine and estimated of Anurans species. Population and also analyzed that which is the water quality parameter that is dangerous and fatal for them and how can be that redress and relegate. Due to this causes these species (Anura) were on the verge of extinction.

Observation and Result- Table – 1

Sr. No.	Species	No. of individual collected Anurans (Site a, b, c)
1.	Duttaphrynus melanostictus	11+8+13=32
2.	"Bufo" stomaticus	1+2+4=7
3.	Hoplobatrachus tigerinus	5+2+3=10
4.	Microhyla ornata	__+1+__=1
5	Uperodon globulosus	__+__+1=1
Total		**51**

Table – 2 List of anurans found in Agra bank of Yamuna river with their IUCN status (March 2023 to November 2023)

Sr. No.	Species	Family	IUCN	Status
1.	*Duttaphrynus melanostictus (Schneider)*	Bufonidae	VU	Non-edemic
2.	*"Bufo" stomaticus (Lutken)*	Bufonidae	LR-nt	Non-edemic
3.	*Hoplobatrachus tigerinus (Daudin)*	Dicroglossidae	VU	Non-edemic

4.	*Microhyla ornate*	Microhylidae	LR-IC	Non-edemic
5	*Uperodon globulosus*	Microhylidae	LR-nt	Non-edemic

Table – 3 Analysed physico-chemical parameters of Yamuna river: Site – 1 Poia Ghat, Site – 2 Bainpur Reserve Forest, Site – 3 Taj Natural Walk. (March 2023 to November 2023)

Parameters	Sampling Point	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.
CO_2 (Mg/L)	S-a	59	58.5	50.2	49.15	46.6	32	19.2	10.5	16.5
	S-b	7	5.7	6.5	6.8	4.3	4.8	5	2.8	2.6
	S-c	58	59	55	55.2	49.2	48.1	21.5	21.5	19.5
Alkalinity (Mg/L)	S-a	823	621	755	844	232	360	458	495	580
	S-b	620	701	695	590	201	220	235	238	201
	S-c	844	722	802	868	331	420	490	590	602
Magnesium (Mg/L)	S-a	40	29	18	20	18.5	22	25	15	13.5
	S-b	42	44.6	35	28	27.5	23	23	22.5	22
	S-c	39	30	26.5	27.8	16.4	15	14	15	16.5
Na (Mg/L)	S-a	18.5	18.8	17.2	20.2	19	16.4	17	18.5	15
	S-b	70.2	69.3	65.4	81.2	80	88	87	88.9	86.3
	S-c	19.5	17.5	17.9	20	15.5	18	19	19	16.2

Discussion

Duttaphrynus melanostictus which use usually known as the common Indian Toad, such as Indian Toad was gray in colour with many patches of red and brown. Although frog skin was excessively tuberculated with various black spine tipped warts. Hence this Indian frog mostly feeds on insects and also consumes many pests and plants, thus it is a great economic importance for us. As we found that these places, and caught from roadsides, park and paddy places also playground during evening and late hours. We have found in S-a – 11 — and S-b – 8 moreover found that S-c-13.

"Bufo" stomaticus commonly we known as marbled toad also it is a medium sized toad. In colour of skin varies from gray and also with distinguished bright yellowish tint in male toads, although they got caught during in breeding season, even they were found individually in all sites mainly during period of late evening when moving around in grouping in search of food also these species can dig a hole in wet sand very easily. Species sample observed near about S-a – 1, S-b – 2, then S-c – 4.

Haplobatrachus tigerinus : It is studies known as the Indian bull frog, mainly due to its weight and big size. This frog skin colour varies from olive green to brown accompanied by variation in climatic condition and also habitat. Moreover, male frogs are smaller and bright during the breeding period. Unfortunately due to excessive population such species near about the extension mode or declining of this species. An other feature of deteriorate of this species is unrestricted trade and commercial purposes of school lab practical purposes of school lab practical and mostly manufacturing units. Thus species caught in summer and monsoon season especially in muddy fields, such population found in congregation in moist or damp bed of nullahs or under drainage covers of forest areas. Thus species appeared majority, site – a = 5 and site – c = 3 then site – b = 2.

Microhyla ornata: This species observed only individual of the smallest microhylid. *Microhyla ornata* was monitoring dwelling in the Bainpur (forest sanctuary) under in paddy field.

***Uperodon globulosm*:** Such species also investigated as gray balloon frog. Especially due to expanded balloon like abdomen that's why we called that balloon frog and it was found in the mud at the edge of the river but it was only one species seen as we caught near by Taj nature walk. During observation of Anurans it was considered that both species of "Bufo" were mostly and large scale adapted to semi arid urban circumstances and appeared to have coped by spreading settlement within colonization and also due to human intervention. As other member of Ranidae, mainly dependent on everlasting or perennial water are still largely confrontation extinction due to spreading with speed of urbanization and also including shrinkling wetlands. While that was specially observed that the species account reported and considered in the present research restrain more figure of species than ever reported considerably in the given area. Therewith, to eternally found species, together with also succeeded in collecting specific as uperoden glabulosum and *Microhyla ornata*. Such study focuses to examine or analysis the alter nation in quality of Yamuna river at Agra various locations in the year 2023 duration of month March to November. In a case water parameters were analysed and studied the changes and variations in the quality of water of river Yamuna and also measured in various range, these parameters will have measured and mainly it was well known that the what was the impact on Anurans family and also their population and their is no purity of water quality and due to high toxicity non potable for drinking purposes.

CO_2- Values were presented with the exception S-a (Polia Ghat) having a minimum range in Oct. 10.5 mg/L and higher value appeared in month March as 59 mg/L S-b studied value such as in month June presented maximum moreover in month November 2.6 mg/L and site-c. Taj nature walk in higher ranges varies from 59 mg/L in April and lower range varies from 19.5 mg/L November month.

Alkalinity- Alkalinity of Yamuna river analysed of weak acid in it and of the additionally of the cations balanced against them due to month in June at site-a considered ranges about maximum ranges 844 mg/L moreover lower from 232 mg/L in July. Site-b estimated value varies higher in April 701 mg/L and lower in July and November both similar value 201 mg/L. Where site-c considered lower value about 331 mg/L July moreover higher 868 mg/L in month of June.

Chlorides- Chloride become naturally in all types of aquatic system or arrangement. Such as maximum concentration of chloride factor is a highly indicator of contamination, causes of organic waste of animal core and industrial waste. Such value of chlorides in the present study were estimated from 895 mg/L higher due to month August and 560 mg/L lower in July at site-a Poia Ghat. Where the value ranging at site-b – 798 mg/L maximum in May and due to month October varies 491 mg/L minimum at site-c presented value maximum 898 in August and lower 1590 mg/L in November.

Magnesium - As the source of Mg in natural water are many types of industrial waste toxic metals, sewage and rocks, hence a huge evidence that hard water which a great perform in heart diseases for human beings. Afterthen causes of Mg in high concentration compel and makes the water stiff and also unpalatable and within react aperient for beings. Mg value were observed and recorded at site-a between 15 mg/L to 40 mg/L due to October and March. Moreover site-b Mg value varies from between 22 mg/L – 44.6 mg/L in November and April. Sampling site-C analysed data values varied from 39 mg/L maximum and 14 mg/L minimum,

maximum record in March secondly minimum due to September.

Na (Sodium)- Natural fresh water is major source of sodium element which is the weathering of many rocks unfortunate various industrial sewage and domestic garbage are big factors in sodium increases its concentration and accumulate in natural river water after neutralization. The value of sodium varied from between 15 mg/L minimum moreover 20.2 mg/L higher due to November and June, at site-a. Then at site-b ranges from due to October 88.9 mg/L maximum and 65.4 mg/L minimum in May. After then site-a maximum value 20 mg/L in June and minimum 16.2 mg/L in November.

Conclusion

The Present research revealed deterioration to the water quality of Yamuna river and considered that due to high pollution level or large extent at the some study sites, which is causing destruction and alarming in rich scale or damage to the aquatic creatures. Firstly in view of finding and recommend in such study are made for treated water quality management of Yamuna River and also restrain human activities. Hence, local public has to be informed and suggested the about wastes or disposal do not dumping into river and the municipal waste sanitary effluents domestic sewage and also industrial effluents should not be discharged into river its main reason to deterioration of water quality. Other than this should not factory, building or urbanization where in place of rivers, ponds and lakes. Especially to human beings have no rights interference in life of aquatic fauna? The existence of this organism is essential to maintain normal balance in nature. While the industrial effluents should be treated properly before they are drained out; instead a central sewage must be provided or instructed for first there. City wastes material should be dumped into deep pit areas and proper separation of biodegradable and nonbiodegradable wastes material should be done so that it does not flow into rivers drain during rain. Well regulated rivers monitoring of drinking water sources should be done.

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